

UNITED STATES DEPARTMENT OF AGRICULTURE
FLOOD CONTROL COORDINATING COMMITTEE
Washington

MAR 8 1940
No. 54
Ag 84 File

October 9, 1939.

MEMORANDUM NO. 54

MEMORANDUM FOR FIELD FLOOD CONTROL COORDINATING COMMITTEES:
(Through B.A.E., F.S., and S.C.S.)

Subject: Transmittal of Pajaro Survey Work Outline and Review Statement.

Recognizing the importance of adequately prepared Survey Work Outlines, the Committee is herewith distributing for your careful study copies of the Pajaro Survey Work Outline and review statement. This material is being sent you at this time in view of its value in improving the character of the Work Outlines now in process of preparation in the field.

The Pajaro Outline is considered a good one for its region because it deals specifically with the problems and conditions of the particular watershed involved.

Your particular attention is called to the last paragraph of the Committee's review statement which expresses the policy that Work Outlines are an essential part of the survey.

FLOOD CONTROL COORDINATING COMMITTEE

By Arthur C. Ringland
Arthur C. Ringland, Chairman.

Attachments (2)

UNITED STATES DEPARTMENT OF AGRICULTURE
FLOOD CONTROL COORDINATING COMMITTEE
Washington

October 9, 1939.

(Attachment to Memorandum No. 54, October 9, 1939)

MEMORANDUM FOR FIELD FLOOD CONTROL COORDINATING COMMITTEES 18 - 20:
(Through B.A.E., F.S., and S.C.S.)

Subject: Review of Pajaro Survey Work Outline.

The Flood Control Coordinating Committee has received the Pajaro Survey Work Outline. Its review of this outline indicates that a satisfactory basis has been developed for the initiation and conduct of the Pajaro survey and the Field Committee and the group responsible for preparing this outline are to be commended for their efforts. The Flood Control Coordinating Committee is, therefore, recommending to the Secretary that the survey be authorized and is requesting the allocation of a partial allotment to permit immediate initiation of certain phases of the survey.

There are, however, some items which require explanation and several questions which need early answering, pending final approval of the cost estimate. These are as follows:

1. Flood and Silt Damage: (Page 4)

Some indication should be given in the outline of the types of data available, shortcomings in these data, how it is proposed to supplement them, and the time and personnel required. This point should also be stressed in future work outlines.

2. Precipitation: (Page 4)

The outline (Appendix A) lists seven gages in operation in or near the watershed whereas the nation-wide Weather Bureau inventory map lists nine. The outline indicates no recording gages whereas the Weather Bureau map indicates four in operation in or near the drainage basin. Of these one is within the area itself.

Two recording rain gages are requested. It is felt, however, that for complete coverage there should be five such gages altogether. In addition to the two proposed one recording gage might be placed near Hernandez and another near San Martin. Perhaps it is anticipated that two gages will be installed by the Army and two by the Department, but if so, this is not indicated. If such an arrangement cannot be worked out the survey should furnish its own gages.

As the report indicates, gages should be installed immediately before start of the rainy season. Are any of the gages now on hand, including those previously sent you, available for this purpose? If not, please let us know at your earliest convenience.

3. Stream Flow and Silt Sampling Stations: (Page 5)

The proposed installations are satisfactory as regards the larger sub-drainages. Question is raised as to whether the Soil Conservation Service and other agencies involved have sufficient data on complete watersheds to permit the desired evaluation of conservation practices. Since plot data are qualitative in the sense that they cannot be applied directly to large complex watersheds, it may be necessary to establish two or three small installations on medium-sized watersheds (about 100 - 200 acres) as a means of tying in existing records and proposed plot studies to actual run-off. Our understanding is that the Corralites SCS project has facilities for measuring run-off from small areas (around 10 to 15 acres each). Several additional installations covering areas of 100 to 200 acres might be valuable in relating the measurements from the small watersheds to the larger units. These should be recording gages and installed and operated by the survey.

As regards cooperation with the Corps of Engineers on the contribution of each agency to the installation and operation of the six major gaging stations, you should work out the necessary arrangements locally. Those gages which it is mutually agreed should be installed and operated by Agriculture may be purchased without further clearance.

As regards cooperation with the U. S. Geological Survey on silt sampling, it is still too early to discuss permanent arrangements. Meantime the survey should count on installing and operating its own silt-sampling stations. This memorandum constitutes approval for the purchase of the needed silt-sampling equipment without further clearance.

The provisions for silt sampling appear satisfactory. It is noted, however, that you propose to obtain one year's records, yet you indicate elsewhere that the basic investigation phase of the survey is to continue for only four months. Is it intended, therefore, to utilize only four months silt-sampling records?

4. Infiltration Studios: (Page 6)

Although one infiltration crew is mentioned, we note in Table 1 that you are providing for five technicians for this work. The assumption from this is that you will in reality have two crews of two men each (1 P-1 and 1 SP-5) with a unit leader for the whole group. In any case, we question whether one infiltration crew will be adequate to obtain the necessary information in four months. Referring again to Table 1 we note that only Forest Service men are to be utilized for this purpose. Might it not be desirable to provide for Soil Conservation Service representation, particularly in view of the importance of agricultural land use in

the area and of the need for broader participation in this important phase of the survey? If this will require a shift of funds between the two Bureaus, your budget estimates should be revised accordingly.

5. Economic Studies on Comparable Areas: (Page 7)

The outline should cite specifically some of the economic studies you refer to as having been made particularly as they bear on the problems of this watershed. It is assumed that the enterprise efficiency studies and economic crop reviews are pertinent to the type of agriculture in this watershed.

6. Considerations in Preparation of Remedial Measures:

In connection with the preparation of remedial measures, such items as the status of relief, rural living standards, opportunities for the stabilization of income, and increased employment should be given serious consideration. This is apart from the question of availability of labor in the event operations were undertaken.

Attention should also be given to the local attitude towards cooperation in an operations program, both of individual land owners and operators, and groups and associations.

7. Evaluation Procedure:

Consideration should be given to the physical and economic interpretation of the physical data collected during basic investigations with particular reference to their subsequent use, during the final phase of the survey, in developing the cost-benefit ratio. This should be provided for in the work outline by a statement somewhat as follows: "Cost and benefit data on proposed remedial measures, or groups of associated measures will be assembled, or determined, in such a manner as to be most readily usable in the evaluation of the economic and social results of the program. The evaluation will cover the flood control benefits and other benefits, such as increased crop yields, that will result from the program." (See Memorandum No. 44 in the above connection).

8. Equipment Costs: (Table 1)

The equipment purchase item needs explanation. Does it include the two half-ton pickups and the one three-quarter-ton truck listed on page 10? We note also that one infiltrometer unit is included (if five men are to be used for this work why is only one infiltrometer unit set up?). Does it also include the establishment of stream gage stations?

9. Personnel Assignments: (Table 1 and Chart)

Analysis of the man months distribution and of the distribution of salaries, travel and other items by Bureaus for each of the two main phases of the survey, indicates well balanced disposition of men and money. The number and title of personnel to be assigned to each type of work listed should also be shown. This might be done by indicating under

each heading the appropriate job number as given in the table. We note further that no provision is shown for regional supervision under Basic Investigations. This should be clarified.

The table should also be checked again for possible duplication of personnel listed.

General Comments

Following are additional comments or suggestions which it is hoped will be of value particularly in the preparation of subsequent work outlines:

Survey Objectives: (Page 1)

The term "Objectives" has been misunderstood. What are really listed under this heading are the types of information which the survey aims to gather in achieving certain specific objectives of the survey. To illustrate, the outline itself indicates (top page 2) that the lower Pajaro channel is able to pass maximum flows provided the San Benito River is not at flood stage. Obviously a major objective of the survey would be to develop such measures as will prevent or minimize the danger of the San Benito flood flow synchronizing with the flows from the other tributaries of the main river. As a further clarification of this objective some indication might be given of whether agricultural measures alone are to be utilized to desynchronize flood flows or whether partial dependence is to be placed on other measures such as might be included in an Army Engineering program.

It is assumed that item 4 refers to the remedial program which will be financed wholly or in part from flood control funds.

Item 5 might have been better stated as follows:

"If data obtained in items (1) to (3) indicate there is no significant flood problem, or if one exists but no flood control measures by the Department of Agriculture are considered feasible, the survey report will summarize the land and water use problems of the watershed and indicate desirable lines of action by appropriate agencies of the Department out of non-flood control funds."

Aerial Surveys: (Page 2)

With reference to item 3, are contact prints needed for the entire watershed or only for certain sample portions thereof? Index maps (scale 2" - 1 mile) for portions of the area already flown will be sent you within 6 weeks and it is suggested that when they are received, and on the basis of initial reconnaissance study, you reconsider your request for contact prints for the entire watershed.

Types and Sequence of Work: (Page 3)

We assume that the term "flood induced erosion" under 1 (b) refers

to such damage as bank cutting and scouring of flood plains by the action of flood waters. If not, please explain.

Storm Types: (Page 5)

As you know, the Weather Bureau has been allotted funds for air-mass analysis leading to the preparation of design storms for watersheds in which we are interested. The Weather Bureau has been asked to include the Pajaro watershed in their storm-analysis project and is now taking steps to that effect.

Sedimentation Studies: (Page 6)

Satisfactorily covered.

Run-off and Soil Loss Data: (Page 6)

No comment except as covered under stream-flow stations.

Effects of Existing Programs on Run-off and Erosion: (Page 7)

We assume the Soil Conservation Service has enough data to make the evaluation on the basis of the records of the four small watersheds on which they are now making studies. It may be that a study of the comments on stream flow above may lead you to reconsider the adequacy of existing installations.

Social and Economic Characteristics . . . : (Pages 7 - 8)

Regarding incidental benefits to the land, emphasis should be placed on the effects of the Flood Control program on family income and well being. We assume that emphasis will be laid on ownership trends rather than primarily on existing ownership. With reference to population it is suggested that State and County highway maps showing the location of houses be used as a basis for estimating number and distribution of population.

The sub-heading Water Economy should also include a study of water rights ownership and the relation of the amounts and distribution of water appropriated to the supply of water.

Survey Party Headquarters Location: (Page 9)

We assume that full and adequate consideration has been given both to the availability of office space and to housing and other facilities for party personnel and their families.

Completion Dates and Costs: (Page 9)

Some question may be raised whether there will not be greater variation in the period of time required to complete the various basic investigations than is indicated in Table 2.

County Land Use Planning Committee: (Appendix C, page 1)

With regard to the "intensive land use planning survey" soon to be undertaken, it will probably be necessary to check on the character of these surveys to avoid duplication and to assure correlation of effort. Names of counties involved might well have been included in the outline.

Farm Credit Administration: (Page 3)

The statement under this heading appears to conflict with the statement under item 5, Farm Security Administration. Basis for differences in viewpoint between the two agencies might be looked into.

Table I:

This table is well prepared and together with Table II gives a good picture of the timing of the work. We believe it would have been more desirable, however, to show the same breakdown by Bureaus for basic investigations as is shown for report preparation.

We note further that no provision is shown for regional supervision under the column Basic Investigations.

Because the Committee considers the Survey Work Outlines as an essential part of the surveys, it is important that your outline be revised as indicated above (pages 1 - 3) as the first order of business and resubmitted at the earliest possible date.

FLOOD CONTROL COORDINATING COMMITTEE

By

Arthur C. Ringland, Chairman.

TENTATIVE SURVEY WORK OUTLINE

DETAILED REPORT

FOR THE

PAJARO RIVER

/s/ Harry E. Reddick

Soil Conservation Service

HARRY E. REDDICK, Co-Chairman Field Coordinating Committees 18 & 20

/s/ E. I. Kotok

Forest Service

E. I. KOTOK, Co-Chairman

Field Coordinating Committees 18 & 20

/s/ Edwin E. Wilson

Bureau of Agricultural Economics

EDWIN E. WILSON, Member

Field Coordinating Committees 18 & 20

UNITED STATES DEPARTMENT OF AGRICULTURE

September 8, 1939

SURVEY WORK OUTLINE
PAJARO RIVER WATERSHED

Introduction

The Pajaro River watershed covers 1290 square miles in San Benito, Santa Clara, Santa Cruz and Monterey Counties in the Central California Coastal Basin area. About 91 percent of this area is privately owned, the remaining 9 percent being publicly owned (1% National Forest and 8% Public Domain). As to land use, 24 percent is devoted to intensive agriculture, 64 percent is in grazing land, and 12 percent is brush, chaparral, redwood and pine timber. Approximately 325 square miles present serious erosion conditions, the location and extent of which are indicated on Map. 1. These areas contribute to flood and sedimentation damages to an extent sufficient to justify survey by the Department of Agriculture.

1 (a) Survey objectives

1. Determination of amount and location of past, recurring, and potential damages by flood waters and water-borne sediments, and classification of specific types of damages based on related, economic and physical aspects.
2. Determination of flood and sediment source areas in the order of their importance as contributors to specific types of flood and sediment damage.
3. Determination of economic and physical aspects of water utility, land use and other watershed problems related to floods, water flow retardation, and soil erosion prevention.
4. If data resulting from objectives 1 to 3 indicate that a remedial program is feasible, the survey will proceed with the formulation and evaluation of a technically feasible remedial program.
5. If data resulting from objectives 1 to 3 indicate there is no justification for a remedial program financed from flood control funds, a negative report will be prepared. The report will summarize and analyze the problems and indicate desirable lines of action by other agencies.

(a) Flood and Silt Source Areas

Four principal flood source areas are delineated on Map 1, which indicates related critical silt producing and flood damage sites, and the overall problems and causes involved. The relative importance and interdependence of these source areas as related to floods is significant. The lower Pajaro Channel has sufficient capacity to pass maximum flows from the Pacheco, Uvas-Carnadero and Corralitos drainages, provided the San Benito River is not at flood stage. Flood damages from the first three streams mentioned above are largely confined to local areas and are of second and third importance. Floods in the Watsonville-Pajaro district will occur when the San Benito tributary is at flood stage; however, when flood flows from all source areas are concentrated in the lower Pajaro, capital floods result.

(b) Aerial Surveys

Sixty percent or approximately 500 square miles of the watershed has been flown to a usable specification and an additional 10 per cent or about 130 square miles may become available if present Agricultural Adjustment Administration requests are met by the contractor of a going survey. (See Map 2).

There remains a pressing need for additional aerial surveys, scale 1:1667 (standard specifications), for approximately 300 square miles, including principally the Pacheco and Corralitos drainages. If present Agricultural Adjustment Administration requests do not materialize for the Uvas-Carnadero area, an additional area of about 130 square miles should be flown.

For each series of surveys the following maps and prints are desired:

1. One aerial mosaic, scale approximately 1/2 inch to the mile. This mosaic will provide a large scale photograph of the watershed, necessary to correlate the relationship of the various areas under consideration and study.
2. One index map of the contact prints. Required for ready orientation of the individual prints and rapid procurement from the files.
3. Two sets of contact prints, one to be used in the field by the survey crews and the other in the office for stereoscopic study of problem areas, cover, topography and stream channels.

The aerial photographs will appreciably reduce the amount of field work necessary and will effect a direct saving in time and money.

(c) Types and sequence of work

Sequence	Refer to Section (d)	Types of Work
1	(b)	Accurate determination and classification of damages by floods, flood induced erosion and sedimentation.
	(g)	Sedimentation study and analysis.
	(b),(d),(e)	Meteorological and hydrological studies and analysis.
2	(k)	Cooperation with other agencies.
	(c),(f),(g)	(Determination of deficiencies in all basic data and initiation of action to meet deficiencies.
	(h), (i),(j)	
3		Formulation and evaluation of remedial program.

(d) Provisions to be made for meeting deficiencies in basic data.

*a. Physical classification of watershed

There are sufficient data (listed below) on which to base the location of sample areas. Type locations of soil, geologic formations, erosion and cover conditions, will be selected in each flood source area, as required. Further study of these site conditions will include investigation of infiltration capacity and erosion loss to determine their relation to downstream flood damages.

1. Detailed conservation survey (soil, land use and cover, slope and erosion) maps (1 inch = 500 feet) of Soil Conservation Service Corralitos project, 30,000 acres; and of off project farms scattered throughout the area totaling about 16,000 acres.
2. Western Range Survey of San Benito County, Includes combined detailed reconnaissance conservation and range survey.
3. Reconnaissance conservation survey of Pajaro watershed. Entire watershed surveyed by preliminary examination field crew with particular emphasis placed on critical silt source areas and broad soil groupings related to geologic conditions.

* All sub-letters refer to section on Basic Investigations, Memo. 44.

4. U.S.D.A. soil survey bulletins showing soil types of valley agricultural lands:
 1. Soil survey of Hollister area, 1927 (published).
 2. Soil survey of Santa Cruz area (to be published).
5. Geologic map of California, State Bureau of Mines, recent map (1938) shows principal geologic formations with reference to various detailed Federal, State, University surveys and other unpublished data within the Pajaro watershed.
6. Cover type maps by Forest Survey Division, California Forest & Range Experiment Station, on a scale of 1:62,500. Shows cover types by individual species.

b. Flood and Silt Damages

Damage data in preliminary examination are incomplete and require verification. A complete damage survey of all flood and silt damage areas and classification of damages by types and areas is required to provide direction and guidance for physical scientists and for evaluation of remedial proposals and benefits.

c. Precipitation

Records are available for 21 precipitation stations within and adjacent to the watershed, a listing of which appears in Appendix A and their locations on Map 3. Records are lacking for the drainage of Tres Pinos and Pacheco Creeks. It is of first importance to know the extent and intensity of precipitation since these areas form nearly 50 percent of the watershed and contain an important portion of the flood and erosion source areas. The survey will install and begin operation of permanent intensity rain gages on the headwaters of each creek (Map 3). Such operations must begin by October, 1939. The U. S. Weather Bureau will be requested to continue operation of both stations on a permanent basis. The Corps of Engineers also anticipate installation of additional rain gages in the area, but at the present time types of gages and locations have not been determined. Consideration has been given to their proposed installations and gages requested are needed for Department of Agriculture studies in addition to gages contemplated by them.

These records, both existing and to be collected, will be compiled, tabulated and analyzed. A review and analysis of similar studies by the State Division of Water Resources now in progress will determine which neighboring areas may be used for comparison.

These studies will determine the extent and relation of precipitation to both capital and damaging floods. Particular attention will be given to the rainfall patterns of the San Benito watershed, since this is the only area that is capable, singly, of causing widespread damage.

d. Storm Types

There is very little information available on storm types. Limited information is available from two sources - the U. S. Weather Bureau and studies in adjacent areas by the State Division of Water Resources. The data available will be analyzed and correlated with meteorological and hydrological data collected under (c) and (e), to indicate storm characteristics, patterns, and their relation to damaging floods.

e. Stream Flow and Silt Sampling Stations

All available streamflow records from the 12 known stations (Map 3) that have been operated are summarized in Appendix B. Only one, Uvas Creek near Morgan Hill, is in operation at the present time. In order to obtain information on the relative importance of the various flood source and critical areas, six gaging stations are recommended for installation, as follows:

1. *Pacheco Creek near mouth (also proposed by Army)
2. Pajaro River near mouth " " " "
3. *Tres Pinos Creek near mouth
4. San Benito River near mouth " " "
5. San Benito River below Willow Cr. " " "

The Corps of Engineers also plan installation of some of the gages proposed by the Department of Agriculture as noted above. Other installations listed above are required for determination of runoff relationship of various critical areas in sub-units within the watershed. Decision as to which agency will request installation of gages jointly considered has not as yet been made.

There has been no systematic silt sampling to date, although samples occasionally taken by local residents indicate a significant silt problem. The sampling stations recommended will provide suspended load data necessary to supplement the conclusions of the sedimentation surveys in order to approximate the total quantity of erosion debris contributed from various critical areas. These stations will be installed and initially operated by the survey. The arrangements for maintenance of these stations under permanent basis should be made with the U. S. Geological Survey. It is recognized that conclusive information cannot be obtained from one year's records; however, such records will indicate the relative order of magnitude of streamflow and suspended load from the various flood source and critical areas.

* Silt sampling will be undertaken at these locations and an additional silt sampling station will be installed on Pajaro River near Watsonville.

f. Infiltration Studies

There are no infiltration data available. Detailed information on infiltration capacities is needed to more definitely establish rainfall-runoff relationships.

Existing information on broad soil groups and cover types indicate that there are significant differences in infiltration rates. This information will form the basis for locating representative sample areas (typical sites) within the broad groups by an infiltration specialist. These typical sites will be further investigated by an infiltrometer survey to be conducted by a mobile crew.

g. Sedimentation Studies

There is a lack of specific information relative to amounts and rates of sedimentation and the consequences involved. Information is necessary to provide a basis for estimating the extent and nature of valley sedimentation, channel filling with consequent capacity loss, erosion losses from watershed lands, and siltation rates for any proposed reservoirs.

The approach to this problem will be:

1. Study of siltation ratios in existing reservoirs within the watershed or in comparable areas to establish a ratio of sediment production per unit area of watershed.
2. Study of valley and channel aggradation by establishing old buried surface horizons, and measuring the overlying modern deposits.

The sedimentation specialist will make a complete review of all data on existing reservoirs, maps and records of old railroad, highway, irrigation or other surveys, and other secondary sources. Those data will be analyzed and a definite plan of attack developed by the sedimentation specialist, who will call on a mobile crew as needed for field investigations.

h. Runoff and Soil Loss Data

Studies will be made of all existing surface runoff and erosion data, including those undertaken by the Soil Conservation Service in their Corralitos demonstration projects. These include small watershed and surface runoff and erosion plot data. These data, together with those collected and compiled under sections (a), (b), (c), (f), and (g), will be analyzed and correlated to localize major contributing areas of runoff and soil erosion in relation to flood damages and capital floods. Additional surface runoff and erosion plot studies

(rain maker type) on selected sites within the localized areas will be initiated to furnish qualitative information on the relation of cover density, duration and intensity of rainfall to surface runoff and erosion.

i. Effects of Existing Programs on Runoff and Erosion

Analysis of the effects of existing soil conserving programs on runoff, waterflow retardation and soil erosion are necessary to evaluate the benefits to be derived from a remedial program. Sources for this information are the Soil Conservation Service project at Corralitos and various off project programs in effect on 16,000 acres scattered throughout the area and all other soil conserving programs in other comparable areas.

j. 1. Economic Studies on Comparable Areas

Collection and review of such studies will be made to avoid duplication of work. Data so obtained will probably be most extensively used in evaluation of remedial measures, although it will be made immediately available to the physical scientists for such value as it may have in providing direction to their work.

Important among the generalized economic studies by the California Agricultural Experiment Station which will provide data of this nature applicable to those areas are: Types of farms in California; index ratings of economic potentialities of California soils; enterprise efficiency studies and economic reviews on lettuce, apricot, prune, pear, sugar beet, milk and beef production.

2. Social and economic characteristics of the Watersheds

Those will be developed on a flood and silt damage and flood and silt source area basis. Historical background and population will be interrelated with land economy and use and water economy to establish relationships between continued benefits from a flood control program and the maintenance or improvement of social and economic values within the watershed.

a. Historical development. Information is available from secondary sources.

b. Population. Data are available from secondary sources for the preparation of maps showing distribution of population within flood and silt damage and source areas.

c. Land ownership. Many data are available from maps of the BAE and Forest Service. Where more complete data are required, detailed investigation of specific areas will be made.

d. Land Utilization. This will be broken down by flood and silt damage and source areas under the following classifications:

(1) Arable farming. Data on those farms can largely be secured from secondary sources and by interpretation of SCS Project area data. This phase of the work will include types of farming, extent and practices of irrigation, cultural and cropping systems and relationship between land use and physical features. Limited selective sampling for study of farm organization on specific types of farms may be required to supplement secondary data.

(2) Livestock ranching. A comprehensive study of size, organization and interdependence of range with cultivated arable areas will be made. If there is a need to supplement the substantial secondary data on this type of farm, a limited number of ranch organization studies will be made in the flood source areas. Regional facilities are adequate for efficient direction of any surveys required.

(3) Other land uses. Sufficient data on woodland, wild life, and recreational values can be obtained from the Forest Service and the Biological Survey upon which to establish the importance and relationship which the economy of these areas bears to the watershed as a whole.

e. Water economy. Present and future sources, use and duty of water can be obtained from study of past and proposed developments of the Hollister Irrigation District, the Pachoco Pass Water Conservation District, Santa Clara Conservation District, State Division of Water Resources, Western Range Survey, and the State Extension Service studies. These sources should provide sufficient data to evaluate remedial proposals affecting the water economy of this region from an economic and social standpoint.

3. Institutional Considerations

Consideration will be given to all laws (especially the State Zoning Enabling Act, the Soil Conservation District Act and Flood Control Acts), regulations and policies which may influence any flood control measures proposed. There are available regional facilities which will provide legal assistance necessary in this work. Relationships which tax delinquency and land tenure may present will be considered during this part of the survey, should such considerations appear necessary. (There is a close relationship between this phase of the survey work and paragraph k).

k. Cooperation with Other Agencies

Establish immediate contact with all appropriate agencies and organizations within the watershed to determine their plans, to insure their clear understanding of the objectives of the Department of Agriculture programs, to avoid a duplication of effort and to provide the best possible cooperative basis for conducting the survey and for any subsequent programs which may be initiated. This phase of the work will be continuous. Principal agencies within this area and a brief statement of their activities are given in Appendix C.

(c) Survey Party Organization and Personnel Assignment Timing

The proposed survey party organization is indicated on Table 1. Timing of personnel assignments is shown on Table 2. The item of Personal Services under Regional Supervision includes proportionate salaries of the field working committee and other Regional personnel engaged in overall flood control report preparation. The extent to which technical assistance may be desired from Washington is not known at this time.

(f) Survey Party Headquarters Location

Hollister has been tentatively selected as the location for survey party headquarters, primarily because of its being the most central location for travel. (See Map 1).

(g) Completion dates and Costs

The time required for completion of the investigative phase is four months from beginning of the survey. An additional four months will be required for report preparation, including formulation and evaluation of the remedial program.

The following uniform per diem rates will apply when in travel status from official headquarters, except in Government or personally subsisted camps. No per diem will be paid when personnel are stationed at field headquarters.

Per diem rate of \$4.00 for period not to exceed 30 days

For a period of assignment in excess of 30 days, change of station will be requested.

Per diem rate of \$2.00 will apply when employees are in subsisted camps, the Government to provide transportation and all equipment required.

This uniform rate will apply to the entire field working group, both for basic investigations and report preparation, when in travel status.

The following automotive equipment will be required at the field survey party headquarters and will be used by all bureaus.

- 1 5-passenger, 4-door sedan (with trunk)
- 4 5-passenger, 2-door sedan (with trunks)
- 2 Station wagons (with rear door)
- 2 1/2-ton pick-ups
- 1 3/4-ton truck with express on screen-side body

One complete infiltrometer unit will be required. The estimate for this is included in Table 1.

PAJARO WATERSHED

PRECIPITATION STATIONS

January, 1939

APPENDIX -B-

**STREAM FLOW RECORDS
PIJARO WATERSHED DRAINAGE B.**

January 1939

PIJARO WATERSHED DRINKING WATER

January 1939

NO.	GAGING STATION	AGENCY	RECORDS AVAILABLE	WATER SHED AREA, IN SQ. MI.	FLOOD PEAKS IN C.F.S.			
					24 HOUR		HOURLY	
					IN ACRE FEET	IN. MAX.	ANNUAL MAX.	GREAT- EST
A	San Benito R. near Hermandex	from chts. Hirstel,			85	2,944	Est. 450	1,264
B	McCoy Creek near mouth	Neuman Mutual Hus- bandry Club	1922-23	17				
C	*San Benito R. near Tres Pinos	applica.to Fed'l Power Commission	1922-23	355				
D	**Tres Pinos Cr. nr Tres Pinos	Nov. 1923	1920-23	205	961	Est. 150	Est. 90	
E	Las Iguiillas Cr. near mouth	Pajaro River at Watsonville	1911-13	37	90			
F	Uvas Creek near Morgan Hill	U.S.S.G.S.	1911-13	1070	22,400	9820	16,100	560
G	*San Benito River at Carr Bridge	U.S.S.G.S.	1931-Date (1923-32)	30	66,240	1930	23,598	542
	**Tres Pinos Creek at Bolendo Park	Cross Rept.	(1935-37) (1923-31)	353	34,057			
	Pacheco Creek	Fr. Cross Rept (1931-37) 1923-	201	20,678		9,437		
	Corralitos Creek at Corralitos	Hollister Irrig. Dist.	1925-28 1935-36	149	26,212	4,775	10,819	
	**Llagas Creek	U.S.S.G.S. Tibbetts Rept. on Santa Clara W.C. Proj.	1936-37	19	10,320	10,320		
		Mar. 1921				20	21,160	900
							9,660	
								*** Same Station?
								** 3 Years measured - balance estimated.

APPENDIX C

Cooperative Agencies within Pajaro River Watershed

1. County Land-Use Planning Committees.

The Extension Service has organized those committees in San Benito and Santa Cruz Counties. Only general recommendations for the agricultural development of these counties have been advanced by the committees, including extensive cover cropping and soil erosion prevention. Intensive land-use planning surveys will soon be undertaken.

2. Soil Conservation Demonstration and Project Areas.

The Corralitos Creek Project includes 40,000 acres of which 30,000 acres are in this watershed. This project and the Pinto Lake CCC Camp Area have cooperative agreements for demonstrational work covering 195 farms (11,028 acres). In addition, soil conservation is also practiced in a less intensive manner on the balance of the project area (approximately 19,000 acres). There is also an "off area" demonstration program carried on in cooperation with the Agricultural Extension Service on 12 farms (approximately 15,865 acres) within this watershed but outside the project area.

3. U. S. Engineers.

On August 14, 1939, the U. S. Engineers initiated a detailed survey of this watershed. Early authorization of a D. A. survey will permit the maximum cooperative work in securing deficiencies in basic data and in correlating proposed measures for control of flood erosion, run-off, and siltation problems in this area.

4. Pajaro River Protective District.

This district embraces an area of 8,900 acres, 296 of which are within the city limits of Watsonville. The original district was formed in 1914. The district was reorganized in 1929 for the purpose of building structures to protect the area from floods. It has succeeded in constructing temporary levees which have aided in controlling minor floods in parts of the area, particularly in the City of Watsonville.

5. Farm Security Administration.

There are only approximately 40 F.S.A. clients in this watershed, principally in the Watsonville, Hollister and Gilroy districts. F.S.A. does not consider this area as a good financial risk, since their applicants have very small farm units, most of their lands lack irrigation water, and their farm resources are small. Only one out of four of their applicants in this area qualify for F.S.A. loans, compared to a 1:2 ratio for the State.

6. Hollister Irrigation District.

The District was organized in 1923, includes 24,453 acres within this watershed, of which 21,000 acres are irrigated. There are 1553 individual holdings in the District, of which 610 are farms and 943 town lots. Individual wells provide the major source of water, but the District leases and operates a 3500 acre-foot reservoir on San Benito Creek (owned by the San Benito Land and Water Company) which serves approximately 1500 acres near Hollister, by gravity distribution. The District has diverted a part of the flow of Tres Pinos Creek onto spreading grounds for underground replenishment and stabilization of the water table.

7. Pachoco Pass Water District.

This district was formed in 1930, and covers 5600 acres embracing 65 farms. In 1937 a 40-acre-foot reservoir was constructed on Las Viboras Creek at a cost of \$14,000 from which, in 1938, it is estimated that 2,700 acre-foot of water was distributed into spreading grounds. In March 1939 a 6000 acre-foot reservoir was completed on the North Fork of Pachoco Creek at a cost of \$300,000. This reservoir storage is for spreading over percolation beds to replenish underground water supplies in the District. Plans have been made for enlarging this reservoir and securing additional water for storage from the South Fork of Pachoco Creek by means of a diversion canal.

8. Agricultural Adjustment Administration.

This organization rates this area as very cooperative. On the basis of payments during 1938 this watershed area shows 95 percent cooperation on wheat, 75 percent on orchard and 50 percent on general crops. Also, while only 15% of the livestock ranches qualified for benefit payments, the acreage involved comprised 40 percent of the range land in the watershed.

9. Farm Credit Administration.

This agency has no restrictions on loans within this watershed, and considers the area a good financial risk. There have been very few loan applications from land owners in this watershed as compared to other similar areas within the State.

10. State Division of Forestry.

The Division, in cooperation with the counties, has an active operative fire control program in this watershed. Stockmen have been very aggressive in building firebreaks and in fire suppression. Negligible losses from fire in recent years reflect the effective cooperation from the livestock ranches in this area.

PAJARO WATERSHED

FIELD HEADQUARTERS - HOLLISTER

Total Required (Other than Aerial Surveys) - \$62,000

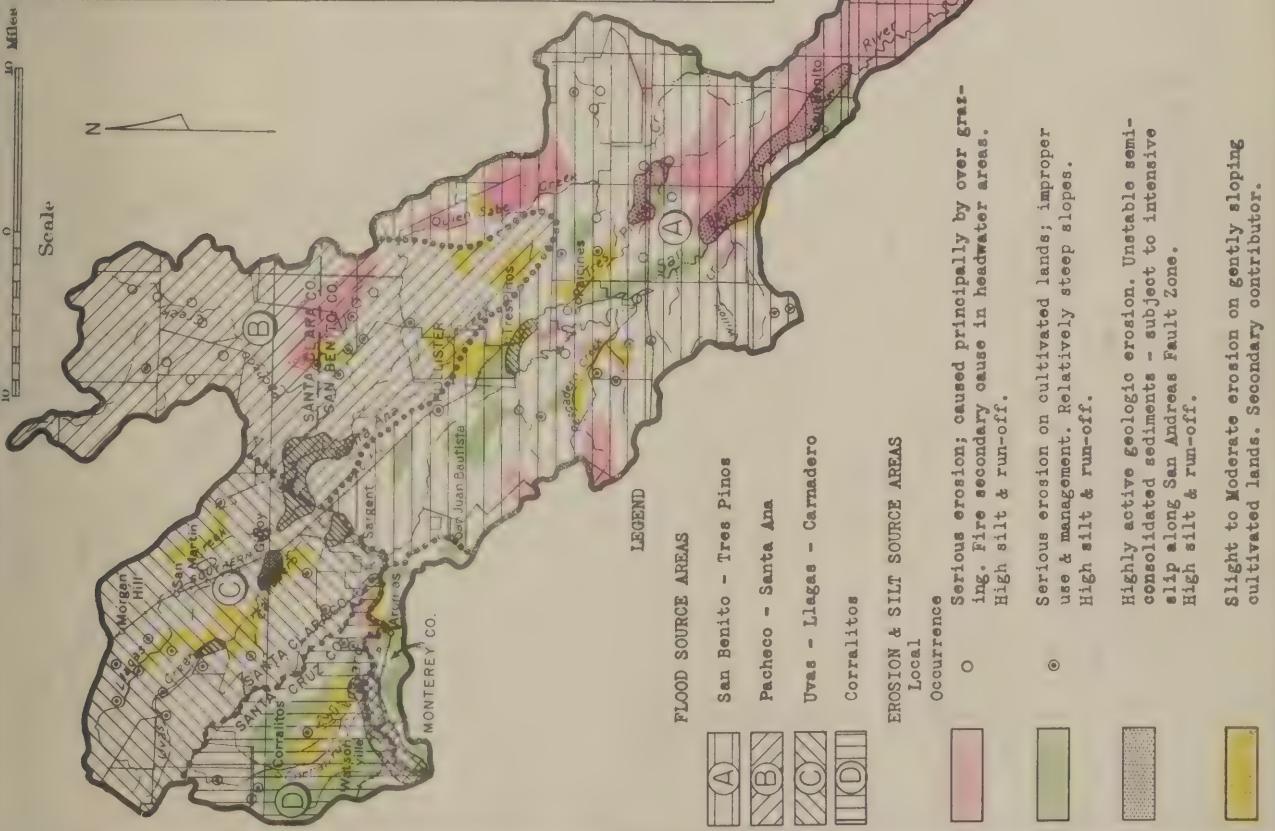
Required for Basic Investigations - \$35,093.22

Required for Report Preparation - \$26,906.78

ASSIGNMENT	BASIC INVESTIGATIONS												REPORT PREPARATION (FORMULATION AND EVALUATION OF REMEDIAL PROGRAMS)												TOTAL			
	SCS (Chairmanship Responsibility)						BAE						FS															
	:Pos.: :No. : Position, Grade and Rate	:Months: :Req'd : Amount	:Pos.: :No. : Position, Grade and Rate	:Months: :Req'd : Amount	:Pos.: :No. : Position, Grade and Rate	:Months: :Req'd : Amount	:Pos.: :No. : Position, Grade and Rate	:Months: :Req'd : Amount	:Pos.: :No. : Position, Grade and Rate	:Months: :Req'd : Amount	:Pos.: :No. : Position, Grade and Rate	:Months: :Req'd : Amount	:Pos.: :No. : Position, Grade and Rate	:Months: :Req'd : Amount	:Pos.: :No. : Position, Grade and Rate	:Months: :Req'd : Amount	:Pos.: :No. : Position, Grade and Rate	:Months: :Req'd : Amount	:Pos.: :No. : Position, Grade and Rate	:Months: :Req'd : Amount	:Pos.: :No. : Position, Grade and Rate	:Months: :Req'd : Amount	:Pos.: :No. : Position, Grade and Rate	:Months: :Req'd : Amount				
Regional Supervision																												
Total Personal Services																												
Travel and Per Diem																												
Other (Rent, Supplies, etc.)																												
Equipment Purchases																												
Total Other than Personal Serv.																												
TOTAL																												
FIELD ORGANIZATION																												
Project Leader and Technical and Administrative Units																												
SCS 1 Soil Scientist, P-4	4	1266.66	1	1266.66	1	1266.66	4	1266.66	4	1266.66	4	1266.66	3	Assoc. Conservationist, P-3	4	1066.66	3	Assoc. Conservationist, P-3	4	1066.66	1	1066.66	1	1066.66	1	1066.66		
SCS 2 Assoc. Conservationist, P-3	4	1066.66	2	Assoc. Conservationist, P-3	4	1066.66	4	1066.66	4	1066.66	4	1066.66	4	1066.66	4	1066.66	4	1066.66	4	1066.66	4	1066.66	4	1066.66				
FS 3 Assoc. Conservationist, P-3	4	1066.66	4	Assoc. Economist, P-3	4	1066.66	4	Asst. Geologist, P-2	6	1300.00	6	Asst. Soil Surveyor, P-2	4	866.66	4	Asst. Soil Surveyor, P-2	4	866.66	4	Asst. Economist, P-3	4	1066.66	4	1066.66	4	1066.66		
BAE 4 Assoc. Economist, P-3	4	1066.66	5	Asst. Range Examiner, P-2	4	866.66	7	Asst. Range Examiner, P-2	4	866.66	8	Asst. Agri. Engr., P-2	4	300.00	9	Asst. Agric. Engr., P-2	4	300.00	11	Asst. Economist, P-2	4	866.66	10	Asst. Hydraulic Engr., P-2	2	433.33		
SCS 5 Asst. Geologist, P-2	6	1300.00	6	Asst. Range Examiner, P-2	4	866.66	8	Asst. Agri. Engr., P-2	4	300.00	9	Asst. Agric. Engr., P-2	4	300.00	11	Asst. Economist, P-2	4	866.66	19	Jr. Forester, P-1	4	666.66	1	666.66	1	666.66		
SCS 6 Asst. Soil Surveyor, P-2	4	866.66	7	Asst. Range Examiner, P-2	4	866.66	9	Asst. Agric. Engr., P-2	4	300.00	12	Jr. Hydr. Engr., P-1	4	666.66	13	Asst. Soils Techn., P-2	4	666.66	18	Jr. Hydr. Engr., P-1	4	666.66	19	Jr. Forester, P-1	4	666.66		
SCS 7 Asst. Range Examiner, P-2	4	866.66	8	Asst. Range Examiner, P-2	4	866.66	10	Asst. Range Examiner, P-2	4	866.66	11	Asst. Soils Techn., P-2	4	666.66	12	Jr. Ecologist, P-1	4	666.66	20	Jr. Soils Techn., P-1	4	666.66	21	Jr. Ecologist, P-1	4	666.66		
FS 10 Asst. Hydraulic Engr., P-2	4	866.66	9	Asst. Range Examiner, P-2	4	866.66	11	Asst. Range Examiner, P-2	4	866.66	12	Jr. Ecologist, P-1	4	666.66	13	Asst. Soils Techn., P-2	4	666.66	22	Jr. Soils Surveyor, P-1	4	666.66	23	Jr. Economist, P-1	10	1066.66		
BAE 11 Asst. Economist, P-2	4	866.66	10	Asst. Range Examiner, P-2	4	866.66	12	Asst. Range Examiner, P-2	4	866.66	13	Jr. Ecologist, P-1	4	666.66	14	Asst. Soils Techn., P-2	4	666.66	24	Jr. Economist, P-1	4	666.66	25	Jr. Economist, P-1	4	666.66		
BAE 12 Asst. Economist, P-2	5	1066.66	11	Asst. Range Examiner, P-2	4	866.66	13	Asst. Range Examiner, P-2	4	866.66	14	Jr. Ecologist, P-1	4	666.66	15	Asst. Soils Techn., P-2	4	666.66	26	Jr. Soils Surveyor, P-1	4	666.66	27	Jr. Economist, P-1	4	666.66		
* FS 13 Asst. Soils Techn., P-2	4	866.66	12	Asst. Range Examiner, P-2	4	866.66	14	Asst. Range Examiner, P-2	4	866.66	15	Jr. Ecologist, P-1	4	666.66	16	Asst. Soils Techn., P-2	4	666.66	28	Jr. Soils Surveyor, P-1	4	666.66	29	Jr. Economist, P-1	4	666.66		
FS 18 Jr. Hydr. Engr., P-1	4	666.66	13	Asst. Range Examiner, P-2	4	866.66	15	Asst. Range Examiner, P-2	4	866.66	16	Jr. Ecologist, P-1	4	666.66	17	Asst. Soils Techn., P-2	4	666.66	30	Jr. Soils Surveyor, P-1	4	666.66	31	Jr. Economist, P-1	4	666.66		
FS 19 Jr. Forester, P-1	4	666.66	14	Asst. Range Examiner, P-2	4	866.66	16	Asst. Range Examiner, P-2	4	866.66	17	Jr. Ecologist, P-1	4	666.66	18	Asst. Soils Techn., P-2	4	666.66	32	Jr. Soils Surveyor, P-1	4	666.66	33	Jr. Economist, P-1	4	666.66		
* FS 20 Jr. Soils Techn., P-1	4	666.66	15	Asst. Range Examiner, P-2	4	866.66	17	Asst. Range Examiner, P-2	4	866.66	18	Jr. Ecologist, P-1	4	666.66	19	Asst. Soils Techn., P-2	4	666.66	34	Jr. Soils Surveyor, P-1	4	666.66	35	Jr. Economist, P-1	4	666.66		
* FS 21 Jr. Ecologist, P-1	4	666.66	16	Asst. Range Examiner, P-2	4	866.66	18	Asst. Range Examiner, P-2	4	866.66	19	Jr. Ecologist, P-1	4	666.66	20	Asst. Soils Techn., P-2	4	666.66	36	Jr. Soils Surveyor, P-1	4	666.66	37	Jr. Economist, P-1	4	666.66		
SCS 22 Jr. Soils Surveyor, P-1	4	666.66	17	Asst. Range Examiner, P-2	4	866.66	19	Asst. Range Examiner, P-2	4	866.66	20	Jr. Ecologist, P-1	4	666.66	21	Asst. Soils Techn., P-2	4	666.66	38	Jr. Soils Surveyor, P-1	4	666.66	39	Jr. Economist, P-1	4	666.66		
BAE 23 (2) Jr. Economist, P-1	10	1066.66	21	Asst. Range Examiner, P-2	4	866.66	20	Asst. Range Examiner, P-2	4	866.66	21	Jr. Ecologist, P-1	4	666.66	22	Asst. Soils Techn., P-2	4	666.66	40	Jr. Soils Surveyor, P-1	4	666.66	41	Jr. Economist, P-1	4	666.66		
BAE 24 Jr. Economist, P-1	1	166.66	22	Asst. Range Examiner, P-2	4	866.66	21	Asst. Range Examiner, P-2	4	866.66	22	Jr. Ecologist, P-1	4	666.66	23	Asst. Soils Techn., P-2	4	666.66	42	Jr. Soils Surveyor, P-1	4	666.66	43	Jr. Economist, P-1	4	666.66		
FS 27 Engr. Aide, SP-5	4	600.00	23	Asst. Range Examiner, P-2	4	866.66	22	Asst. Range Examiner, P-2	4	866.66	23	Jr. Ecologist, P-1	4	666.66	24	Asst. Soils Techn., P-2	4	666.66	44	Jr. Soils Surveyor, P-1	4	666.66	45	Jr. Economist, P-1	4	666.66		
* FS 28 (3) Engr. Aide,																												

DESCRIPTION OF FLOOD SOURCE AREAS

Flood Source Area	% of Total Watershed	Description and Major Problems	Causes
San Benito - Tres Pinos (A)	52%	Key flood source area. Must be at flood stage to produce floods at Watsonville. Serious sedimentation in channels. Extensive areas of severe to very severe accelerated geologic erosion. High silt and run-off.	Heavy overgrazing; cultivation of steep slopes. Fire secondary cause in headwaters. Serious bankcutting. Highly erodible, unstable soils and geologic materials. Extensive slip movement along active San Andreas fault zone.
Pacheco-Santa Ana (B)	23%	Drains into San Felipe Lake which acts as natural regulating basin and overflows into Pajaro River through Miller Canal. Not a major contributor to Watsonville floods. Lowering water table and inundation of valley lands.	Erosion on steep dry farmed slopes of Santa Ana. Some overgrazing. Scattered local overgrazed and cultivated areas in Pacheco drainage.
Uvas-Carmadero-Llegas (C)	16%	Upper watershed in good condition. Occasional floods vicinity of Gilroy. Bank erosion and local damage to agriculture. Excess runoff and silt contributed from foothill agricultural lands.	Steep slopes farmed with no regard for erosion prevention. Lack of adequate bank protection.
Corralitos (D)	7%	Upper watershed in excellent condition. Bank erosion and local damage to agriculture.	Improper land use and management on steeply sloping, extremely erodible light textured soils.



PAJARO WATERSHED

CALIFORNIA FLOOD EROSION, SILT SOURCE AND FLOOD DAMAGE AREAS

FLOOD DAMAGE AREAS IN ORDER OF IMPORTANCE

Watsonville-Pajaro Valley. Damage to urban property, transportation facilities, & high value specialty crop lands. Flood frequency about one in four years.

Gilroy. Damage principally to urban property & transportation facilities; local damage to agriculture. Flood frequency not known; is considerably less than Watsonville area.

San Felipe Basin & other localities. Damage mainly to relatively low value agricultural lands.

FLIGHTS REQUESTED BY WESTERN DIVISION
OF AAA IN CONNECTION WITH SAN JOSE AREA

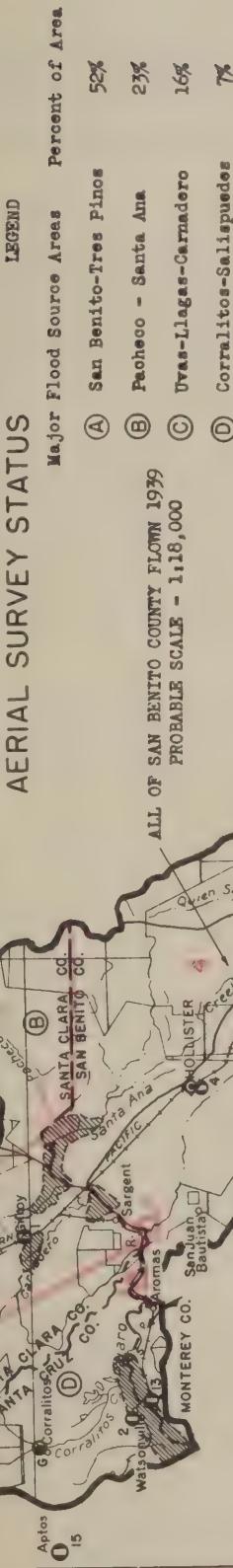
PAJARO WATERSHED
CALIFORNIA

FLOOD SOURCE AREAS

GAUGING STATIONS

AREAS SUBJECT TO FLOODING

AERIAL SURVEY STATUS



Gauging Stations

Stream Flow

Rainfall

Floods

Areas Subject to Flooding

Intensity Precipitation Stations Needed ● Reestablish
Additional Stream Gauging Stations Needed ▲ Reestablish

Proposed Survey Party Headquarters ◆

See accompanying tabulation for existing Stream
Gauging and Precipitation Station Records.

8 0 Gonzales

7 0 Soledad

9 0 Oldria

11 0 Hernandez

10 0 Tres Pinos

12 0 Benito

13 0 Carmadero

14 0 Morgan Hill

15 0 Watsonville

16 0 Corralitos

17 0 Salinas

18 0 Aptos

19 0 San Martin

20 0 Pacheco

21 0 Uvas

22 0 Higas

23 0 Santa Ana

24 0 Morgan Hill

25 0 Watsonville

26 0 Salinas

27 0 Aptos

28 0 San Martin

29 0 Pacheco

30 0 Uvas

31 0 Higas

32 0 Santa Ana

33 0 Morgan Hill

34 0 Watsonville

35 0 Salinas

36 0 Aptos

37 0 San Martin

38 0 Pacheco

39 0 Uvas

40 0 Higas

41 0 Santa Ana

42 0 Morgan Hill

43 0 Watsonville

44 0 Salinas

45 0 Aptos

46 0 San Martin

47 0 Pacheco

48 0 Uvas

49 0 Higas

50 0 Santa Ana

51 0 Morgan Hill

52 0 Watsonville

53 0 Salinas

54 0 Aptos

55 0 San Martin

56 0 Pacheco

57 0 Uvas

58 0 Higas

59 0 Santa Ana

60 0 Morgan Hill

61 0 Watsonville

62 0 Salinas

63 0 Aptos

64 0 San Martin

65 0 Pacheco

66 0 Uvas

67 0 Higas

68 0 Santa Ana

69 0 Morgan Hill

70 0 Watsonville

71 0 Salinas

72 0 Aptos

73 0 San Martin

74 0 Pacheco

75 0 Uvas

76 0 Higas

77 0 Santa Ana

78 0 Morgan Hill

79 0 Watsonville

80 0 Salinas

81 0 Aptos

82 0 San Martin

83 0 Pacheco

84 0 Uvas

85 0 Higas

86 0 Santa Ana

87 0 Morgan Hill

88 0 Watsonville

89 0 Salinas

90 0 Aptos

91 0 San Martin

92 0 Pacheco

93 0 Uvas

94 0 Higas

95 0 Santa Ana

96 0 Morgan Hill

97 0 Watsonville

98 0 Salinas

99 0 Aptos

100 0 San Martin

101 0 Pacheco

102 0 Uvas

103 0 Higas

104 0 Santa Ana

105 0 Morgan Hill

106 0 Watsonville

107 0 Salinas

108 0 Aptos

109 0 San Martin

110 0 Pacheco

111 0 Uvas

112 0 Higas

113 0 Santa Ana

114 0 Morgan Hill

115 0 Watsonville

116 0 Salinas

117 0 Aptos

118 0 San Martin

119 0 Pacheco

120 0 Uvas

121 0 Higas

122 0 Santa Ana

123 0 Morgan Hill

124 0 Watsonville

125 0 Salinas

126 0 Aptos

127 0 San Martin

128 0 Pacheco

129 0 Uvas

130 0 Higas

131 0 Santa Ana

132 0 Morgan Hill

133 0 Watsonville

134 0 Salinas

135 0 Aptos

136 0 San Martin

137 0 Pacheco

138 0 Uvas

139 0 Higas

140 0 Santa Ana

141 0 Morgan Hill

142 0 Watsonville

143 0 Salinas

144 0 Aptos

145 0 San Martin

146 0 Pacheco

147 0 Uvas

148 0 Higas

149 0 Santa Ana

150 0 Morgan Hill

151 0 Watsonville

152 0 Salinas

153 0 Aptos

154 0 San Martin

155 0 Pacheco

157 0 Uvas

158 0 Higas

159 0 Santa Ana

160 0 Morgan Hill

161 0 Watsonville

162 0 Salinas

163 0 Aptos

164 0 San Martin

165 0 Pacheco

166 0 Uvas

167 0 Higas

168 0 Santa Ana

169 0 Morgan Hill

170 0 Watsonville

171 0 Salinas

172 0 Aptos

173 0 San Martin

174 0 Pacheco

175 0 Uvas

177 0 Higas

178 0 Santa Ana

179 0 Morgan Hill

180 0 Watsonville

181 0 Salinas

182 0 Aptos

183 0 San Martin

184 0 Pacheco

185 0 Uvas

186 0 Higas

187 0 Santa Ana

188 0 Morgan Hill

189 0 Watsonville

190 0 Salinas

191 0 Aptos

192 0 San Martin

193 0 Pacheco

194 0 Uvas

195 0 Higas

196 0 Santa Ana

197 0 Morgan Hill

198 0 Watsonville

199 0 Salinas

200 0 Aptos

201 0 San Martin

202 0 Pacheco

203 0 Uvas

204 0 Higas

205 0 Santa Ana

206 0 Morgan Hill

207 0 Watsonville

208 0 Salinas

209 0 Aptos

210 0 San Martin

211 0 Pacheco

212 0 Uvas

213 0 Higas

214 0 Santa Ana

215 0 Morgan Hill

216 0 Watsonville

217 0 Salinas

218 0 Aptos

219 0 San Martin

220 0 Pacheco

221 0 Uvas

222 0 Higas

223 0 Santa Ana

224 0 Morgan Hill

225 0 Watsonville

226 0 Salinas

227 0 Aptos

228 0 San Martin

229 0 Pacheco

2210 0 Uvas

2211 0 Higas

2212 0 Santa Ana

2213 0 Morgan Hill

2214 0 Watsonville

2215 0 Salinas

2216 0 Aptos

2217 0 San Martin

2219 0 Pacheco

2220 0 Uvas

2221 0 Higas

2222 0 Santa Ana

2223 0 Morgan Hill

2224 0 Watsonville

2225 0 Salinas

2226 0 Aptos

2227 0 San Martin

2228 0 Pacheco

2229 0 Uvas

2220 0 Higas

2221 0 Santa Ana

2223 0 Morgan Hill

2224 0 Watsonville

2225 0 Salinas

2226 0 Aptos

2227 0 San Martin

2228 0 Pacheco

2229 0 Uvas

2220 0 Higas

2222 0 Santa Ana

2223 0 Morgan Hill

2224 0 Watsonville

2225 0 Salinas

2226 0 Aptos

2227 0 San Martin

2228 0 Pacheco

2229 0 Uvas

2220 0 Higas

2222 0 Santa Ana

2223 0 Morgan Hill

2224 0 Watsonville

2225 0 Salinas

2226 0 Aptos

2227 0 San Martin

2228 0 Pacheco

2229 0 Uvas

2220 0 Higas

2222 0 Santa Ana

UNITED STATES DEPARTMENT OF AGRICULTURE
FLOOD CONTROL COORDINATING COMMITTEE
Washington

October 12, 1939.

MEMORANDUM NO. 55

MEMORANDUM FOR FIELD FLOOD CONTROL COORDINATING COMMITTEES:
(Through B.A.E., F.S., and S.C.S.)

Subject: Preliminary Examination Program, F. Y. 1940.

1. Reference is made to paragraph 5 of Memorandum No. 46 of August 14, 1939, subject: "Watersheds Approved for Preparation of Survey Work Outlines." It will be noted that the preparation of survey work outlines is for the present to take precedence over preliminary examination activities and that no additional preliminary examinations should be undertaken until the new survey work outlines as authorized have been prepared.

2. It is desirable to depart from a rigid application of the prohibition on the undertaking of preliminary examinations to the extent this is possible without interference with the preparation of survey work outlines. As stated in paragraph 3 of Memorandum No. 46 it is desired to have a number of survey work outlines available in order that a greater number of final surveys, especially those of high priority, may be undertaken.

3. With this end in view, there is attached a list of watersheds for preliminary examination which the appropriate committee is authorized to initiate as circumstances dictate. Allotments have now been made available to permit this work although it will be understood that provision for financing such survey work outlines as are authorized must be made first by the field committees since these allotments provide both for preliminary examinations and the preparation of survey work outlines. While this list has been correlated with the Army program no attempt has been made to designate the priorities within the various Engineer Districts or Committee areas; these should be determined by each Committee after consultation with the appropriate District Engineer and in consideration of the conclusions reached by the War Department where examinations have been completed.

4. It will be noted that a few watersheds on the attached list have been included in the preliminary examination reports already completed. If so, no further consideration needs to be given in your preliminary examination program. While the watersheds listed represent the probable units for coverage by War Department reports, the Field Committees are authorized to make such groupings for coverage in single reports as they deem advisable.

5. The list of watersheds approved for preliminary examination will be expanded from time to time by recommendation of the field committees or otherwise, but examination of any watershed not on this list should be approved in advance by the Flood Control Coordinating Committee.

FLOOD CONTROL COORDINATING COMMITTEE

By Arthur C. Ringland
Arthur C. Ringland, Chairman.

<u>Committee</u>	<u>Watershed</u>	<u>Corps of Engineer District</u>
8 - SCS - Fort Worth	Brazos River, Texas	Galveston
" " "	Buffalo Bayou	"
" " "	Pecan Bayou	"
" " "	Lavaca River, Texas	"
" " "	San Antonio River	"
" " "	San Jacinto River	"
" " "	Santa Isabel Creek	"
8A - SCS - Fort Worth	Cimarron River	Tulsa
11A - FS - Columbus	Jessamine Creek	Cincinnati
" " "	Rough River, Ky.	Louisville
" " "	Cumberland River	Nashville
12 - SCS - Lincoln	Little Missouri River	Omaha
12A - SCS - Lincoln	Pembina River, N.Dak.	St. Paul
" " "	Clearwater R., Minn.	"
" " "	Bois de Sioux River	"
13B - FS - St. Paul	Roseau River, Minn.	"
" " "	Wells Creek, Minn.	"
14A - SCS - Milwaukee	Gilmore Creek	"
" " "	Hay Creek, Minn.	"
" " "	Minnesota River	"
" " "	Chippewa River, Minn.	"
14B - SCS - Milwaukee	Nishnabotna River	Omaha
" " "	Perry Creek, Iowa	"
" " "	Soldier River, Iowa	"
" " "	Grand River, Mo.	Kansas City
" " "	Sangamon River, Ill.	Chicago
" " "	Cedar Creek, Iowa	Rock Island
" " "	Des Moines River	"
" " "	Fox River, Mo.	"
" " "	Galena River	"
" " "	Henderson River, Ill.	"
" " "	Rock River, Ill.	"
" " "	Six Mile Creek, Ill.	"
" " "	Wapsipinicon River	"
" " "	Wyaconda River, Mo.	"
" " "	Illinois River	Tulsa
16 - SCS - Albuquerque	Rio Grande River	Galveston
" " "	La Plata River, Colo.	Los Angeles
" " "	Mancos River, Colo.	"
" " "	Santa Cruz (Lower)	"
16A - SCS - Albuquerque	Big Sandy River	"
" " "	Colorado River, Ariz.	"
" " "	Gila River, Ariz.	"
17 - FS - Ogden	Paonia River, Colo.	"
" " "	Montezuma River	"
" " "	Troublesome, Kremmling	"
" " "	West Divide	"
" " "	Yampa River, Colo.	"

(Attachment to Memo. No. 55, October 12, 1939)

Watersheds Approved for Preliminary Examination F. Y. 1940
(Correlated with War Department Program)

<u>Committee</u>	<u>Watershed</u>	<u>Corps of Engineer District</u>
1 - FS - New Haven	Saco River	Boston
" " "	Housatonic	Providence
" " "	Pawtuxet	"
" " "	Thames River, Conn.	"
" " "	Hudson River	New York
" " "	Hoosic River	"
" " "	Mohawk River	"
" " "	Lackawack River	"
" " "	Kayaderosseras Creek	"
" " "	Mettawee River	"
" " "	New Creek	"
" " "	Otter Creek	"
" " "	Winooski River	"
" " "	Delaware River	Philadelphia
" " "	Black River, N. Y.	Buffalo
3A - SCS - Upper Darby	Susquehanna River	Binghamton
" " "	Lackawanna River	"
" " "	Cayuga Creek	Buffalo
" " "	Cazenovia Creek	"
" " "	Chittenango Creek	"
" " "	Genesee River	"
" " "	Keuka Lake	"
3B - SCS - Upper Darby	Monongahela River	Pittsburgh
4 - SCS - Dayton	Chagrin River	Buffalo
" " "	Miami River, Ohio	Cincinnati
" " "	Mill Creek, Ohio	"
" " "	Sandusky River	"
" " "	Scioto River	"
" " "	Short Creek, Ohio	Pittsburgh
" " "	Hocking River	Huntington
" " "	Lost River, Ind.	Louisville
5A - FS - Asheville	Greenbrier River, W.Va.	Huntington
5B - FS - Asheville	Rappahannock	Washington
" " "	James River	Norfolk
" " "	Meherrin River	"
" " "	Roanoke River	"
" " "	Smith River	"
7A - FS - New Orleans	Tombigbee River	Mobile
" " "	Warrior River, Ala.	"
7B - FS - New Orleans	Caddo Lake Dam & Jefferson-Shreveport Waterway	Vicksburg
" " "	Sulphur River, Ark.	"
" " "	Cossatot River	Denison
" " "	Leaf River, Miss.	Mobile
" " "	Big Black River	Vicksburg
7C - FS - New Orleans	Quiver River, Miss.	"

<u>Committee</u>	<u>Watershed</u>	<u>Corps of Engineer District</u>
17A - FS - Ogden	Great Salt Lake, streams draining into, and Great Basin	Los Angeles
" " "	Green River, Wyo.	"
17B - FS - Ogden	Payette River, Idaho	Bonneville
" " "	Salmon River	"
" " "	Snake River, Wyo.	"
" " "	Snake R., Idaho, Wash., Ore.	"
" " "	Malheur River	"
" " "	Weiser River, Idaho	"
17C - FS - Ogden	Humboldt River, Nevada	Sacramento
18 - FS - Berkeley	Alkali Canyon, Ore.	Bonneville
" " "	American River, Calif.	Sacramento
" " "	Cherokee Canal	"
" " "	Clear Lake	"
" " "	Cottonwood Creek	"
" " "	Fahrens Creek	"
" " "	Duck Creek	"
" " "	Owens Creek	"
" " "	Truckee River	"
" " "	Klamath River, Ore.	San Francisco
" " "	Napa River, Calif.	"
" " "	San Lorenzo Creek	"
" " "	San Lorenzo River	"
" " "	Sonoma Creek	"
" " "	Los Angeles & Ventura Cos. Los Angeles streams draining Santa Monica Mountains	
" " "	Mojave River	"
" " "	San Diego, San Luis Rey,	"
" " "	Tia Juana River	"
" " "	San Jacinto River and	
" " "	Bautiste Creek	"
" " "	Santa Ana River &	
" " "	Banning Canyon	"
" " "	Chino Creek	"
" " "	San Antonio Creek	"
" " "	Santa Clara River	"
" " "	Santa Marguerita River	"
" " "	Whitewater River	"
21 - SCS - Spokane	Birch Creek	Bonneville
" " "	Grande Ronde R., Ore.	"
" " "	Powder River, Ore.	"
" " "	Touchet River, Wash.	"

Corps of
Engineer
District

<u>Committee</u>	<u>Watershed</u>	<u>Corps of Engineer District</u>
22 - FS - Portland	Cedar River, Wash.	Seattle
" " "	Columbia R. & Minor Trib.	"
" " "	Duwamish River	"
" " "	Green River, Wash.	"
" " "	Nazelle River, Wash.	"
" " "	Nisqually River	"
" " "	Snohomish River, Wash.	"
" " "	Stilaguamish River	"
" " "	Whatcom Creek	"
" " "	Wenatchee River	"
" " "	Willapa River	"
" " "	Crooked River	Bonneville
" " "	Palouse River	"
" " "	Alsea River, Ore.	Portland
" " "	Columbia River, Wash.	"
" " "	Coos River, Ore.	"
" " "	Coquille River	"
" " "	Cowlitz River, Wash.	"
" " "	Kilchis River, Ore.	"
" " "	Miami River, Ore.	"
" " "	Nehalem River	"
" " "	Nestucca River	"
" " "	Rogue River	"
" " "	Smith River, Ore.	"
" " "	Tillamook River	"
" " "	Trask River	"
" " "	Umpqua River	"
" " "	Wilson River, Ore.	"
" " "	Yaquina River	"
23A - FS - Missoula	Flathead River	Seattle
" " "	Clark Fork, Wash.	"
" " "	Kootenai River, Idaho	"
" " "	St. Regis River, Mont.	"
23B - FS - Missoula	Milk River, Mont.	Fort Peck
" " "	Upper Missouri River, (Ft. Peck)	"

INVESTIGATION OF FLOODS IN AGRICULTURE

Flood Control Coordinating Committee

October 18, 1939.

Memorandum No. 56.

Memorandum For Field Flood Control Committees:
(Through B.A.E., F.S., and S.C.S.)

Subject: Transmittal of Potomac Watershed Survey Work Outline
and Review Statement.

Memorandum No. 54, October 9, 1939, transmitted the Pajaro Survey Work Outline and Review Statement. The Committee is herewith distributing copies of the Potomac River Watershed Survey Work Outline and Review Statement as further aid in improving the character of Work Outlines now being prepared.

The Pajaro Outline embraced survey problems and procedures representative of western conditions whereas the Potomac Outline reveals problems and procedures representative of eastern conditions. Careful study of this material should clarify some of the points about which there apparently has been some confusion.

Particular attention is called to the section of the Committee's review statement dealing with survey objectives which will apply in general to all surveys.

FLOOD CONTROL COORDINATING COMMITTEE

By Arthur C. Ringland
Arthur C. Ringland, Chairman

UNITED STATES DEPARTMENT OF AGRICULTURE
FLOOD CONTROL COORDINATING COMMITTEE
Washington

October 25, 1939

MEMORANDUM NO. 57

MEMORANDUM FOR FIELD FLOOD CONTROL COORDINATING COMMITTEES:
(Through B.A.E., F.S., and S.C.S.)

Subject: Weather Bureau Personnel.

The Weather Bureau in carrying forward its cooperative work in aid of flood control pursuant to the understanding reached with this Committee has made inquiry concerning the availability of qualified technical personnel to assist in the development of their program. A more complete explanation of the scope of the cooperative arrangement between the Weather Bureau and this Committee will be set forth in a memorandum shortly to be issued to the field.

The following is quoted from a letter dated October 9, 1939 from Mr. Merrill Bernard, Chief of the River and Flood Division, on the need for personnel:

"There is need for approximately twenty sub-professional people which would ordinarily be classified as engineering-aide, sub-professional 5, \$1800. There is also need for a number of Junior and Assistant Hydrologic Engineers to be used in the regional centers at Fort Worth, Kansas City, Iowa City, Albany, Cincinnati and Montgomery.

"This suggestion is made only with the thought that certain particularly qualified people might render more direct service if engaged in the cooperative program."

It is suggested that those interested in the possibility of an assignment to the Weather Bureau should communicate with Mr. Bernard through appropriate bureau channels for further details.

FLOOD CONTROL COORDINATING COMMITTEE

By _____

Arthur C. Ringland

Arthur C. Ringland, Chairman.

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UNITED STATES DEPARTMENT OF AGRICULTURE
FLOOD CONTROL COORDINATING COMMITTEE
Washington

October 31, 1939

MEMORANDUM NO. 58

MEMORANDUM FOR FIELD FLOOD CONTROL COORDINATING COMMITTEES:
(Through B.A.E., F. S., and S.C.S.)

Subject: Water Rights Problems.

Following a meeting of the Washington Coordinating Committee with the Field in Salt Lake City on May 9, the attached copy of a statement dealing with water rights problems was presented by Marion Clawson of the Bureau of Agricultural Economics staff.

It is believed this is an able presentation of the problem and it is transmitted for your information and such assistance as it may offer in the consideration of like problems which may be encountered elsewhere.

FLOOD CONTROL COORDINATING COMMITTEE

By Arthur C. Ringland
Arthur C. Ringland, Chairman.

WATER RIGHTS PROBLEMS IN RELATION TO FLOOD CONTROL SURVEYS
AND ACTION PROGRAMS.

A memorandum prepared by Marion Clawson with the assistance of other Bureau of Agricultural Economics personnel, in response to the committee report submitted at Salt Lake City, May 9, 1939.

In order to appreciate the importance of existing water rights in any flood control program, it is necessary to review briefly the types of rights which may exist on western streams. The most common rights are those for agricultural use, particularly for irrigation. These rights may be to absolute quantities of water as long as the natural flow of the stream exceeds these amounts or they may be to proportionate parts of the natural flow, with or without special provision as to rights under varying conditions of the total amount of natural flow. In addition to rights to the normal or "firm" flow of the stream other agricultural rights are to peak flows for storage or other purposes. Still other agricultural rights are to underground waters, the supply of which is probably related to the volume and seasonal distribution of stream flows or runoff from watersheds. The status of the underground water rights is generally not so clearly established as that of stream flow rights and it is much more difficult to prove or disprove connection between watershed conditions and underground supplies.

In addition to agricultural rights, rights frequently exist for water power development. Mining interests may have rights to the use of certain quantities of water. Timber operators may have rights to use stream flow for various purposes. Urban use of water is important in many areas and municipalities may have water rights. These various rights are generally as to quantity of water but also may involve certain rights as to quality of water as well. Quality would involve such items as freedom from silt or other foreign matter. The rights might also include freedom from obstructions, particularly in the case of timber operators' use of streams. These various rights are not mutually exclusive and the same volume of water may be used for several purposes. This is particularly the case for water used in power development and for irrigation use.

It is apparent that all rights to water have a high degree of seasonality of use. That is, the same volume of water may be much more valuable at one season of the year than at another. Holders of water rights are interested not only in total volume of flow but in its distribution throughout the season. The appropriations or grants of water rights on a great many western streams have been so large as to cover every conceivable flow of that stream both as to total volume and as to seasonal distribution. This means that there are a large number of unsatisfied demands on the stream under normal or less than normal

run-off conditions. Although flood flows may damage some people, yet there are others who are interested in securing the maximum total run-off from a watershed regardless of its seasonal distribution. This is particularly the case when storage capacity greatly exceeds normal run-off available for storage. Under such circumstances, holders of these water rights are unwilling to favor any diminution of total run-off.

The laws relating to water rights in the various western states are generally very complex in character and vary greatly between different states. It is very difficult to secure any changes in water rights laws and any flood control program that might be undertaken will probably have to accommodate itself to the existing laws on water rights.

Water rights should be investigated in connection with all preliminary flood control examinations. Information should be obtained upon the present decreed rights and also upon the extent to which these various rights are satisfied under conditions of normal run-off. It should be relatively easy to find out whether litigation is now pending on water rights and what the history of litigation may have been on this watershed. If there has ever been a general adjudication of water rights on the stream, the terms of such an adjudication should be described very briefly. Some general statements and judgments as to the probable effect of various flood control measures on existing water rights should be made. In addition, will the most likely flood control measures encounter opposition from the holders of existing water rights? Information on these points would give the coordinating Committee an idea regarding the desirability of a detailed survey on this watershed.

In the watershed surveys under the flood control program, it would be very desirable to secure considerably more information regarding the character of water rights than would ordinarily be secured in a preliminary examination. The preliminary examination should note in a general way the character of water rights and particularly whether existing rights would be a serious factor in any flood control program. If existing rights are likely to be affected by a flood control program, the survey should indicate in considerable detail the character of rights, including all court decisions which probably have a bearing upon this particular stream. This analysis of water rights should be very closely linked with an analysis of the hydrology or water cycle of the stream. Under various precipitation conditions, how far are the various water rights satisfied under present conditions? The physical, economic, and legal aspects of water rights and water use should be very carefully investigated.

When a tentative control program for floods is set up, an analysis should be made to show the effect of this control program upon present rights and present use of water. It will be necessary to determine as accurately as possible the

effect of various control measures upon the total run-off and upon its seasonal distribution. Consideration should be given to the effect upon run-off and seasonal distribution under varying conditions of precipitation. It is possible that the effect of flood control measures upon run-off will vary between wet and dry years. Having determined the probable future hydrology of the stream, it will be possible to measure the effect of flood control measures upon different groups of water users. This is probably the most important step in this whole field.

In general control of floods will probably injure but very few, if any, water users and will probably benefit a large number of users. We should frankly recognize injury to any class of water rights when our analysis would seem to indicate such injury.

A rather aggressive program of education will probably be necessary in each watershed in order to inform all groups of water users regarding the effect of various flood control programs. Wherever it can be demonstrated that flood control measures will probably benefit all groups of water users, an educational program should remove any opposition that may exist to specific flood control measures. In the absence of such educational activity, there may readily be considerable opposition to the flood control program. Since it is very difficult, if not impossible, to secure changes in the legal status of water rights, the most feasible procedure will almost certainly be through convincing owners of water rights that their own interests will be best served by cooperation with the flood control program.

As a final step in the consideration of water rights on a watershed survey, a statement should be made regarding the part that existing water rights can play in the promotion or retardation of the flood control program as a whole.

The matter of desirable personnel for consideration of the water right problems should also receive careful consideration. In the preliminary examinations, economists and engineers with western experience and some contact with the water right problem should be competent to analyze the problem in sufficient detail. In the case of watershed surveys, personnel with special legal training will probably also be necessary. Existing water rights on each stream should be the subject of special inquiry by specially trained personnel, including hydrologists, engineers, economists, and legally trained men. Each watershed survey will probably not require the full time of a legal expert throughout the course of the survey. It should be possible to work out an arrangement whereby a specialist in water rights could be shifted from one survey to another as the needs of the work indicated and in order to keep him fully employed.

In both the preliminary examination and watershed surveys, use should be made of the great body of experience accumulated by State Engineers and other state men concerned with the water rights problems in their respective states. This will avoid a large amount of duplication of effort.

